

STS-106 Flight Readiness Review (FRR) Minutes

The STS-106 FRR convened at 8:00 a.m. on Tuesday, August 29, 2000 in the Mission Briefing Room, at the Kennedy Space Center (KSC). The meeting was chaired by George W. S. Abbey, Space Shuttle Program Lead Center Director.

Flight Crew, Ferry Readiness, Range, and DDMS did not have any issues or constraints to flight and did not make formal presentations. Readiness statements submitted were included in the backup package.

The STS-106 FRR presenters were: Mission Summary - J. Bantle (NASA/JSC/DA8); Program Integration - W. Gerstenmaier (NASA/JSC/MA2), L. Ham (NASA/JSC/MA), R. White (USA/JSC/USJ-601M), D. Noah (NASA/JSC/MS); International Space Station - S. Castle (NASA/JSC/OC), Payload Processing - S. Higginbotham (NASA/KSC/NN-H1); External Tank - N. Otte (LMMSS/MAF/MP31); RSRM - T. Boardman (Thiokol/Utah/L00); SRB - R. Elliott (USA/KSC/USK-417); SSME - D. Adamski (Rocketdyne/Canoga Park/AB88); Vehicle Engineering - D. White (USA/Houston/USH-601M), T. Reith (Boeing/JSC/ZC01), D. Lee (NASA/JSC/EV121); EVA - S. Schoenherr (NASA/JSC/XA), A. Flynt (NASA/JSC/XA); Shuttle Processing - J. Vevera (USA/KSC/USK-229), M. Madden (USA/KSC/USK-459), J. Spaulding (NASA/KSC/PH-M1), D. King (NASA/KSC/PH); Mission Operations - J. Bantle (NASA/JSC/DA8), T. Sobchak (NASA/GSFC/451), R. Gest (USA/Houston/USH-402L); Space and Life Sciences - C. Fischer (NASA/JSC/SA); and SR&QA - M. Erminger (NASA/JSC/MQ).

Mr. Gerstenmaier reviewed the Action Item status and closure.

MISSION SUMMARY

The 2A.2b Shuttle overview and payload configuration were presented. Also presented was the launch window, mission objectives, the day-by-day activities and Extravehicular Activity (EVA) summary timeline and mission duration.

PROGRAM INTEGRATION

The Key Mission Considerations dealing with the energy dependent day / launch day opportunity strategy was presented. The Payload System Safety, STS-106 Orbital Debris Status and Launch Commit Criteria (LCC) were also presented. One special topic was presented: Targeted Launch Times for International Space Station (ISS) Missions. Program Integration is ready for flight pending completion of the defined open work.

INTERNATIONAL SPACE STATION (ISS)

The flight content, manifest content, stowage margins and hardware delivery were presented. There were three special topics presented. The first topic discussed adding a twelfth day to provide opportunity to complete additional work. The second topic was the ISS Software Patch Open Work. An action was assigned to status the testing, verification and uplink of the ISS software patch for the node control software attitude control indicator. This action is due at the STS-106 Pre-Launch Mission Management Team Review. The third topic was the Battery Change Out Summary. The ISS Program Status was briefed. The ISS Program is ready to proceed to launch STS-106.

PAYLOAD PROCESSING

The following items were presented: Processing Status, Middeck Experiment Requirements, Launch Delay Requirements and Engineering Status. No issues were

reported. Pending successful completion of scheduled work, the STS-106 Mission Processing Team is ready to proceed with launch.

EXTERNAL TANK (ET)

This is the second ET to fly with full implementation of Intertank foam venting. One change was presented - the Liquid Hydrogen (LH2) Tank Proof Test. There were two processing anomalies presented the first being the Thrust Panel Penetrant Inspection. The second Discrepant Weld Bead Profile. Flight rational was presented for both these anomalies. The ET is ready for STS-106 flight pending completion/closure of open and planned work.

One walk-on issue identified the recent discovery of damage to the ET believed to be caused by a bird of unknown species, and significant enough to necessitate repair. This will be unplanned work at the pad.

REUSABLE SOLID ROCKET MOTOR (RSRM)

The In-Flight Anomaly (IFA) for STS-101 Right Hand (RH) safe and arm (S&A) Actuator Armature Assembly was presented. Changes since the previous flight were presented. The following two dealt with Class I Hardware and LCC: Generic Buckling Certification and Generic Maximum Allowable Ground Winds. Two more changes fall under Noncritical Process; Incorporate Spacer-Augmented Mandrel (SAM) and Throat Ring Tag End Fabrication and Testing, both have been approved.

Three Nonconformances were presented. The first item was the Suspect Contaminated Boron Pellet and Bridging of Environmental O-ring in S&A barrier-boosters (B-B) Basket and the second item involved a Contaminated Glass Bead Hose; both are use as is. The third nonconformance is Defects on Tang Sealing Surface, which has limited use.

Pending satisfactory completion of normal operations flow the RSRM hardware is ready to support flight for mission STS-106.

SOLID ROCKET BOOSTER (SRB)

There were two special topics presented. The first topic was the range safety transition assembly weld penetration. The second was the forward booster separation motor/confined detonating fuse (CDF) initiator electrical bonding not performed. Flight rational was presented for both these topics.

One waiver was presented for the SRB Rate Gyro Assembly (RGA) annual functional test requirement not performed on Serial Number (S/N) 103 RGA. The Vehicle Engineering Board (VEB) approved this waiver.

Pending completion of open work, resolution of Range Safety Transition Assembly weld penetration and CDF initiator electrical bonding issues, there are no constraints for flight for STS-106.

SPACE SHUTTLE MAIN ENGINE (SSME)

The SSME major components, predicted SSME ignition confirm margins, predicted SSME performance at 104.5% performance load (PL) and predicted redline margins at 104.5% PL were presented. Three special topics were presented the first was the SSME E0523 Premature Shutdown. This engine prematurely shut down at Stennis Space Center (SSC) due to high turbine discharge temperatures. The root cause was identified as contamination introduced during assembly and/or pretest processing. Corrective actions are being implemented. The STS-106 engines are acceptable for

launch. The second topic was SSME Joint G3 Blistered Seal. Blisters were noted on the silver plating of two "increased compression" G3 seals after removal from the engine. Flight rationale was presented. The third topic was the Anti Flood Valve (AFV) Contamination. The material composition and location suggests contaminant introduced during AFV housing fabrication and cleaning process. The contamination concern is limited to AFV's processed by Globe Dynamics. There are no Globe Dynamics valves on STS-106. An action was assigned for SSME to present a plan to understand and resolve quality process and contamination issues to the PRCB. They are to also include a discussion on recent vendor and sub-vendor process escapes. The Atlantis Main Engines are in a ready condition for STS-106.

VEHICLE ENGINEERING

The following STS-101 IFA's were presented: Left Orbiter Maneuvering Engine (LOME) Bipropellant Valve 2 Indicates Open, LOME Gaseous Nitrogen (GN2) Regulator Pressure Low During Post-Burn Purges, Ku-Band Radiating Within the Radar Frequency (RF) Protect Box, Power Reactant Storage and Distribution (PRSD) Oxygen (O2) Tank 4 A Heater Temporarily Failed, Collins Tactical Air Command and Navigation System (TACAN) Built-in Test Equipment (BITE) Faults and Slumped Tile at the Wing Leading Edge with Internal Flow. All IFA's were reviewed and none constrain the STS-106 flight.

There were four STS-106 critical process changes presented. The increase in Reinforced Carbon Carbon (RCC) mission life, Main Propulsion System (MPS) gas probe specifications, corrosion control and finish requirements and Thermal Protection System (TPS) Reusable Surface Insulation (RSI) maintenance – tile installation.

One configuration change and certification item was presented. The first flight of the redesigned Advanced Master Events Controller (AMEC). The AMEC is functionally equivalent to the Enhanced Master Events Controller (EMEC). The AMEC certification has been approved. Master Events Controller (MEC's) will be replaced by AMEC's across the Orbiter fleet within the next two flights of each vehicle.

Five special topics were presented. The Multifunction Electronic Display System (MEDS) Integrated Display Processor (IDP) halted unexpectedly following a Mass Storage Unit (MSU) failure; the Orbital Maneuvering System (OMS) Engine Transducer Gaps; the MPS Liquid Hydrogen (LH2) Manifold Repair; the potential contamination of MPS Gaseous Oxygen (GO2) pressurization system and Liquid Oxygen (LO2) prepress disconnect damage. All the special topics are acceptable for STS-106 flight.

Two Government Furnished Equipment (GFE) special topics were presented. The first topic is the high metals content in Shuttle Orbiter Repackage Galley (SORG) water. The risk assessment is low for STS-106 and the samples are within specification. The SORG is acceptable for flight. The second topic is the Space to Space Communication System (SSCS). The Space to Space Orbiter Radio (SSOR) has a potential condition to degrade or interrupt its reception of another radio in close proximity to the UHF Payload Bay Antenna. Current testing may not detect this problem. It's been recommended to fly as is with concurrence by Mission Operations Directorate (MOD), EVA and Safety & Mission Assurance (S&MA).

EXTRAVEHICULAR ACTIVITY (EVA)

The EVA presented the mission overview, which has one scheduled EVA for ISS hardware transfer and assembly. The one unscheduled EVA capability for mission success and two unscheduled EVA capability for Orbiter, Remote Maneuvering System

(RMS) and Orbiter Docking System (ODS) contingencies was also presented. EVA also presented the following: training status; fit check and sharp edge status; the hardware summary; Russian hardware summary; internal transfer summary; Extended Memory Unit (EMU) logistics and stowage and STS-101 fit check process. One open work was presented to finish the crew training requiring completion of the final Engineering Test Article (ETA) runs, Neutral Buoyancy Laboratory (NBL) runs and evaluations. This has an estimated closure date of September 2, 2000.

The EVA Project Office is ready for launch pending completion of the defined open work.

SHUTTLE PROCESSING

The processing differences for this flow were presented. Two open waivers/Exceptions were discussed: Potable water sample odor test and Shuttle Data Center (SDC) Design Certification Review (DCR). Two unexplained anomalies were presented: O2 tank A heater anomaly – this anomaly was presented at the STS-106 Orbiter Roll Milestone Review (ORMR); and ET separation camera #1 blown fuse – the most probable cause was identified as intermittent high current. Flight rationale for the camera is based on successful retesting. Loss of data due to ET camera failure has a criticality of 3. OV-104 wire crimp concerns were reviewed. Actions taken to resolve the suspect errant crimps, acceptance criteria, risk assessment and flight rationale were presented. The launch countdown summary, turnaround options and landing operations status were briefed. Shuttle Processing is ready to proceed with Launch operations.

MISSION OPERATIONS

Significant items and mission firsts for Shuttle ascent/entry, orbit, Space Station and Mission Control Center (MCC) were reviewed. Houston & Moscow support groups were identified. Crew and flight controller training was discussed. Flight rule updates for Shuttle and ISS were presented. STS-106 ascent performance, abort regions and nominal ET impact area were presented. Significant open work items were briefed. MOD has no constraints to STS-106.

Space Operations Management Office (SOMO) presented Networks readiness. Topics presented included STS-101 network anomalies, STS-106 Tracking & Data Relay Satellite Systems (TDRSS) constellation and significant network changes. SOMO dedicated elements and Consolidated Space Operations Contract (CSOC) resources are ready to support the STS-106/2A.2b – Spacehab.

Flight Operations presented requirements compliance, facilities readiness, flight design readiness, flight prep product readiness, training & certification and flight control readiness. Pending completion of identified open work, USA Flight Operations is ready to support flight 2A.2b.

SPACE AND LIFE SCIENCES

Crew health was presented. The Flight Surgeon team was identified. Detailed Test Objective (DTO)/Detailed Supplementary Objective (DSO) were reviewed. Operation support planning & readiness was presented. The Space and Life Sciences Directorate is ready to support Flight ISS 2A.2b/STS-106.

SAFETY RELIABILITY & QUALITY ASSURANCE (SR&QA)

Significant Assessments performed/supported by SR&QA were presented. NASA Safety Reporting Systems (NSRS), Hazard Analysis and Failure Mode Effects Analysis

(FMEA)/Critical Items List (CIL) were summarized. SR&QA has no constraints to STS-106

ACTION ITEMS/EXCEPTIONS

There were two Action Items assigned. One Exception was submitted.

Mr. Abbey polled the principal managers and organizations; all responded that they were prepared to support the STS-106 mission.

William H. Gerstenmaier 9/14/00

William H. Gerstenmaier
Manager, Program Integration

Enclosures:

1. Agenda
2. Action Item Log
3. Exception Log

STS-106
Flight Readiness Review
August 29, 2000

Agenda

Introduction	Manager, Launch Integration
	Program Manager, SFOC
Mission Summary	Flight Director, Mission Operations
Program Integration	Flight Manager
	Manager, Space Shuttle KSC Integration
	Manager, Space Shuttle Systems Integration
	Manager, Space Shuttle Customer and Flight Integration
	APM, Program Integration, SFOC
International Space Station	Manager, International Space Station Program
Payload Processing	Director of ISS/Payloads Processing
External Tank	Manager, External Tank Project
RSRM	Manager, Reusable Solid Rocket Motor Project
SRB	Manager, Solid Rocket Booster Project
	APM, SRB Element, SFOC
SSME	Manager, Space Shuttle Main Engine Project
Vehicle Engineering	Manager, Space Shuttle Vehicle Engineering
	APM, Orbiter Element, SFOC
	APM, Flight Software, SFOC
	APM, FCE/EVA, SFOC
EVA	Manager, EVA Project
Shuttle Processing	Director of Shuttle Processing
	APM, Ground Operations, SFOC
	APM, Integrated Logistics, SFOC
Mission Operations	Director, Mission Operations
	APM, Flight Operations, SFOC
Flight Crew	Director, Flight Crew Operations
Space and Life Sciences	Director, Space and Life Sciences
Ferry Readiness	Ferry Operations Manager
Range	United States Air Force
DDMS	Director, DDMS
SR&QA	Manager, Safety, Reliability and Quality Assurance
Project/Exception/ Action Item Summaries	Manager, Launch Integration
Readiness Poll	Director, Space Shuttle and International Space Station Programs Lead Center

STS-106
FLIGHT READINESS REVIEW
August 29, 2000
ACTION ITEM LOG

CONTROL NO.	ASSIGNEE(S)	ACTION	C	DUE DATE	CLOSURE DATE
106-FRR-001	MISSION OPERATIONS	STATUS THE TESTING, VERIFICATION, AND UPLINK OF THE ISS SOFTWARE PATCH FOR THE NODE CONTROL SOFTWARE ATTITUDE CONTROL INDICATOR.	C	STS-106 PMMT	
106-FRR-002	SSME	PRESENT A PLAN TO UNDERSTAND AND RESOLVE QUALITY PROCESS AND CONTAMINATION ISSUES TO THE PRCB. INCLUDE A DISCUSSION ON RECENT VENDOR AND SUB-VENDOR PROCESS ESCAPES.		10-26-00	

CoFR EXCEPTION LOG

CoFR REVIEW DATE: 08-29-00 STS FLT NO. STS-106			
REQUIREMENT/ EXCEPTION NUMBER	ELEMENT	DESCRIPTION OF EXCEPTION	DUE DATE
001	ORBITER	<p>SSVEO and USA Orbiter Element take an exception to the following NSTS 08117 paragraph: Appendix R, 3.1 FLIGHT ELEMENT PROCESSING, "All flight and ground element processing activities have been performed in accordance with approved work authorization documents." Transducers and closeout plugs on the OMS engines may not meet the installation gap requirements of .004 or .005 inches. The right OMS engine on STS-106 has two transducers which are out of tolerance and one transducer which must be MRed. The closeout plugs have not been inspected on either engine. Verification of the closeout plug gaps and disposition of the out-of-spec transducer gaps and any out-of-spec closeout plug gaps must be completed before flight.</p>	STS-106 PMMT